

CLAIMS

We claim:

1. A die, comprising:

a substrate;

two or more various shaped bump structures formed over the substrate; each of the two or more various shaped bump structures having a solder line; and

5 an epoxy layer formed over the substrate; the epoxy layer having a top surface wherein:

a) the solder lines are below the top surface of the epoxy layer;

b) the solder lines are above the top surface of the epoxy layer;

or

10 c) some of the solder lines are below the top surface of the epoxy layer and some of the solder lines are above the top surface of the epoxy layer.

2. The die of claim 1, wherein one or more of the two or more various shaped bump structures have a first height and one or more of the two or more various shaped bump structures have a second height that is less than the first height.

3. The die of claim 1, wherein the two or more various shaped bump structures have a round shape, a rectangular shape, a square shape, a bar shape or a circular shape.

4. The die of claim 1, wherein at least one of the two or more various shaped bump structures has a bar shape with a width of from about 40 to 300 μm and a length of up to about 3000 μm .
5. The die of claim 1, wherein at least one of the two or more various shaped bump structures has a round shape with a diameter of from about 40 to 300 μm .
6. The die of claim 1, wherein at least one of the two or more various shaped bump structures has a rectangular shape with a width of from about 40 to 300 μm and a length of from about 300 to 3000 μm .
7. The die of claim 1, wherein at least one of the two or more various shaped bump structures has a rectangular shape with a width of from about 100 to 200 μm and a length of from about 350 to 1200 μm .
8. The die of claim 1, wherein at least one of the two or more various shaped bump structures has a square shape with a width of from about 40 to 300 μm .
9. The die of claim 1, wherein at least one of the two or more various shaped bump structures has a square shape with a width of from about 100 to 200 μm .
10. The die of claim 1, wherein at least one of the two or more various shaped bump structures has a circular shape with an outside diameter of from about 150 to 3000 μm and an outside diameter of from about 100 to 2500 μm .

11. The die of claim 1, wherein at least one of the two or more various shaped bump structures has a square and/or rectangular shape and is employed as an RF shield or a Faraday cage.

12. The die of claim 1, wherein the epoxy layer is comprised of thermosetting resins or an underfill coating material.

13. A die, comprising:

a substrate;

two or more various shaped bump structures formed over the substrate; each of the two or more various shaped bump structures having a solder line; one or
5 more of the two or more various shaped bump structures having a first height and one or more of the two or more various shaped bump structures having a second height that is less than the first height; and

an epoxy layer formed over the substrate; the epoxy layer having a top surface wherein:

10 a) the solder lines are below the top surface of the epoxy layer;

b) the solder lines are above the top surface of the epoxy layer;

or

c) some of the solder lines are below the top surface of the epoxy layer and some of the solder lines are above the top
15 surface of the epoxy layer.

14. The die of claim 13, wherein the two or more various shaped bump structures have a round shape, a rectangular shape, a square shape, a bar shape or a circular shape.

15. The die of claim 13, wherein at least one of the two or more various shaped bump structures has a bar shape with a width of from about 40 to 300 μm and a length of up to about 3000 μm .

16. The die of claim 13, wherein at least one of the two or more various shaped bump structures has a round shape with a diameter of from about 40 to 300 μm .

17. The die of claim 13, wherein at least one of the two or more various shaped bump structures has a rectangular shape with a width of from about 40 to 300 μm and a length of from about 300 to 3000 μm .

18. The die of claim 13, wherein at least one of the two or more various shaped bump structures has a rectangular shape with a width of from about 100 to 200 μm and a length of from about 350 to 1200 μm .

19. The die of claim 13, wherein at least one of the two or more various shaped bump structures has a square shape with a width of from about 40 to 300 μm .

20. The die of claim 13, wherein at least one of the two or more various shaped bump structures has a square shape with a width of from about 100 to 200 μm .

21. The die of claim 13, wherein at least one of the two or more various shaped bump structures has a circular shape with an outside diameter of from about 150 to 3000 μm and an outside diameter of from about 100 to 2500 μm .

22. The die of claim 13, wherein at least one of the two or more various shaped bump structures has a square and/or rectangular shape and is employed as an RF shield or a Faraday cage.

23. The die of claim 13, wherein the epoxy layer is comprised of thermosetting resins or an underfill coating material.

24. The die of claim 13, wherein the two or more various shaped bump structures have two sets of heights.

25. A die, comprising:

a substrate;

two or more various shaped bump structures formed over the substrate; each of the two or more various shaped bump structures having a solder line; the two or
5 more various shaped bump structures having a round shape, a rectangular shape, a square shape, a bar shape or a circular shape; and

an epoxy layer formed over the substrate; the epoxy layer having a top surface wherein:

a) the solder lines are below the top surface of the epoxy layer;

10 b) the solder lines are above the top surface of the epoxy layer;

or

c) some of the solder lines are below the top surface of the epoxy layer and some of the solder lines are above the top surface of the epoxy layer.

26. The die of claim 25, wherein one or more of the two or more various shaped bump structures have a first height and one or more of the two or more various shaped bump structures have a second height that is less than the first height.

27. The die of claim 25, wherein at least one of the two or more various shaped bump structures has a bar shape with a width of from about 40 to 300 μm and a length of up to about 3000 μm .

28. The die of claim 25, wherein at least one of the two or more various shaped bump structures has a round shape with a diameter of from about 40 to 300 μm .

29. The die of claim 25, wherein at least one of the two or more various shaped bump structures has a rectangular shape with a width of from about 40 to 300 μm and a length of from about 300 to 3000 μm .

30. The die of claim 25, wherein at least one of the two or more various shaped bump structures has a rectangular shape with a width of from about 100 to 200 μm and a length of from about 350 to 1200 μm .

31. The die of claim 25, wherein at least one of the two or more various shaped bump structures has a square shape with a width of from about 40 to 300 μm .

32. The die of claim 25, wherein at least one of the two or more various shaped bump structures has a square shape with a width of from about 100 to 200 μm .

33. The die of claim 25, wherein at least one of the two or more various shaped bump structures has a circular shape with an outside diameter of from about 150 to 3000 μm and an outside diameter of from about 100 to 2500 μm .

34. The die of claim 25, wherein at least one of the two or more various shaped bump structures has a square and/or rectangular shape and is employed as an RF shield or a Faraday cage.

35. The die of claim 25, wherein the epoxy layer is comprised of thermosetting resins or an underfill coating material.